

U.S. Serial No. 10/672,847 (Attorney Dkt: LIDO:003D1)
Art Unit: 1711

IN THE SPECIFICATION:

Please amend page 3, lines 18 and 20-21, page 15, lines 10 and 11, and page 16, line 6, so that all references to ~~-Me(OH)-~~ or to ~~-MeOH-~~ are deleted and the term "alkali metal hydroxide" substituted therefor as indicated on the attached marked-up pages of the specification.

Please further amend page 15, line 13 by deleting the phrase—Me is an alkali metal—and substituting a period therefor, as indicated on the attached marked-up page of the specification.

PATENT

LIDO:003

Page 3

U.S. Patent No. 4,590,260 to Harada et al. teaches that copoly (amino acids) are produced by heating a mixture of at least one amino acid with at least one of ammonium malate, ammonium maleate or ammonium fumarate, or ammonium salts of malic, maleic or fumaric acid monoamide, or malic, maleic or fumaric acid monoamide or diamide, and
5 hydrolyzing the reaction mixture under neutral or alkaline condition. The method is said to be simple and easy to handle, and therefore, suitable for industrial applications.

U.S. Patent No. 5,362,412 to Hartman, et al., teaches use of iminodisuccinic as a nonphosphorus-containing biodegradable stabilizer, and U.S. Patent No. 5,468,838 to
10 Boehmke; teaches a process for the preparation of polysuccinimide, polyaspartic acid and their salts, where, polysuccinimide, polyaspartic acid and their salts are prepared by reaction of maleic anhydride and ammonia, polycondensation of the resulting product in the presence of a solubilizing agent and, if appropriate, hydrolysis.

15 Patent Application Publication WO9845251A1 of GROTH, et al., entitled "Preparation and Use of Iminodisuccinic Acid Salts," teaches that iminodisuccinic acid alkaline salts can be prepared by reacting maleic acid anhydride (MAA), alkali metal hydroxide (~~MeOH~~), NH₃ and water in a molar ratio of MAA : ~~MeOH~~ alkali metal hydroxide : NH₃ : H₂O = 2 : 0.1 - 4 : 1.1 - 6.5 : 5 - 30 at 70 - 170 °C and 1 - 80 bar for 0.1 - 100 hours. The
20 reaction mixture is mixed with additional H₂O and optionally ~~MeOH~~ alkali metal hydroxide and is freed distillatively of NH₃ at 50-170 °C and 0.1-50 bar and then set at a

LIDO:003

PATENT

Page 15

The preferred process or method of the present invention may be described as follows:

Acid anhydride (or lactone) + polyfunctional amine \rightarrow N- polyfunctional acid common name amide

Then,

5 N- polyfunctional acid common name amide + polyfunctional amine \rightarrow

imido di N- polyfunctional acid common name amide

Or,

Acid anhydride (or lactone) + polyfunctional amine \rightarrow N-acid common name polyfunctional amide

10 Then, N-acid common name polyfunctional amide + acid anhydride + Me(OH) alkali metal hydroxide + $R-NH_2 \rightarrow$ amino acid Me alkali metal salt N-common name polyfunctional amide

Where R is a hydrogen or organic radical and ~~Me is an alkali metal.~~

15 Either method of synthesis of this invention has the ability to produce a chelating compound with at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination without steric hindrance or bond angle limitations.

20 For instance or example:

Malic anhydride + ethanol amine \rightarrow N-ethanolmaleicamide

PATENT

Page 16

LIDO:003

Then, in the same vessel in an aqueous phase,

2 N- ethanolmaleicamide + NH₃ → isomers of N,N -amino diethanolsuccinicamide

In the first step, the primary or secondary amide reaction will occur to yield essentially
5 100% of the desired product. Then the heat from the amide reaction fuels the radical
reaction, in the same vessel at the same time. ~~Me(OH)~~ alkali metal hydroxide, NH₃, or
polyfunctional amine and water further react producing poly functional amine substituted
amino disuccinic acid or salt. All processes occur without the heating commonly needed in
prior art methods for condensing, and occur with fewer raw materials and less equipment
10 than prior art methods, thereby offering an economic advantage over those methods.

I have discovered that all isomers with the added Lewis base functionality (or with Lewis
base functional groups) from either the acid amide or the additional groups attached to the
imido group, have the ability to donate at least five nonbonded pairs without hindrance or
15 bond strain; unlike the non-substituted Iminodisuccinates' isomers, the compounds of the
present invention may find broad commercial use.

Another unique feature of the compounds of the present invention is that they are water
borne and hydrolysis of a polymer will not be necessary. Therefore, with one reaction
20 vessel, at ambient pressure, without the need for heating, the N, N -amino disuccinic
amides of the present invention can be prepared.